ENGINEERING LITERATURE

Supplement to ENGINEERING NEWS. 220 Broadway, New York, July 13, 1911.

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An Analysis of Six Books on Water-Power Engineering; J. W. Woermann, M. Am. Soc. C. E.

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Prototypes for later forms are also given and the book explains the use of voussoirs in some of the first cast-iron bridges in imitation of stone arches, and in still later times the use of ribs in many of the most recent and economical forms of reinforced concrete, somewhat similar to those in metal.

The rise of bridge building in the Roman period, and its decline in the Middle Ages are described, indicating in each case the condition of art and civilization. In view of these facts and a great many more which space will not permit us to even mention here, how can it be truthfully said that "there is little history in it?"

H. G. Tyrrell.

June 28, 1911.

The thirty-third issue of the Statistical Abstract of the United States is now being distributed. This includes 345 tables of statistics compiled by the Bureau of Statistics under the Department of Commerce and Labor. It is particularly weak in vital statistics, perhaps as useful to engineers and sanitarians as any. But 17 states report these statistics. These 17 have a population of 48,776,893 or about 55% of the estimated population of the whole country in 1909. As this report is issued before the returns of the recent census are available many of the tables will need considerable revision.

An Analysis of Six Books on Water-Power Engineering.

By J. W. WOERMANN,* M. Am. Soc. C. E.

The accompanying tabular analysis of six prominent works on water-power engineering should interest engineers who read along this line and particularly those who contemplate purchasing any of these books. The table was not prepared for the purpose of criticising any of these authors, but is the outgrowth of a rough comparison which I made for my own information. In some cases the matter relating to a particular subject is scattered through the book under other headings, making it very easy to classify some of the pages incorrectly, but the ...ubstantially correct.

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Beardsley is the only author who discusses at length the materials of construction—wood, metal, cement, etc.—the others apparently being of the opinion that this topic constitutes a separate field.

Hydraulic construction, cofferdams, pumps, etc., is treated by only three authors, while hydraulic and pneumatic transmission is treated by only one.

The bibliography in Mead is very complete—that on dams, for example, covering seven pages, arranged under subheadings. In Koester the bibliography is less complete, while in the others nothing of this kind is attempted.

On hydraulic topics Mead gives the greatest number of pages in thirteen instances. On electrical equipment Koester gives 160 pages, Lyndon 81, and Beardsley 67.

In descriptions and illustrations of typical plants, Mead and Beardsley give particular attention to those having heads of 10 to 30 ft. VonSchon's drawings illustrate various types, but do not represent actual plants, and as a rule contain no dimensions. Frizell gives drawings of actual plants having heads ranging from 6 ft. to 200 ft. Lyndon describes nine plants and Koester eight plants, each in greater detail than the four other authors. These two authors are the only ones who illustrate the electrical equipment in detail. Five of Koester's plants bring out valuable suggestions from European practice.

It is realized that the table and the preceding statements are in the nature of a quantitative analysis, and that perhaps something should be said as to quality. The writer also realizes, however, that this is a very delicate subject and prefers to leave it untouched, except to state that all six books are clearly written and that no difficulty was experienced in understanding any of the authors.

The total number of pages, the number of illustrations, and the net price of each is given at the bottom of the table.

As to which is the best book for any particular individual will depend principally upon what he desires to know and largely on what he already has in his library.

*Civil and Hydraulic Engineer; Assistant Engineer, Western Division, U. S. Army, Custom House, St. Louis, Mo.

ANALYSIS OF SIX BOOKS ON WATER-POWER ENGINEERING.

	Number of pages					
	Mead.	Beardsley.	Von Schon.	Frizell.	Lyndon	Koester.
Introduction (history and development)	18	..	..	..	..	..
Power (energy, transformation, losses)	21	15	2	..	..	..
Hydraulics, weirs, backwater curve, etc	33	30	19	16	..	4
Water power (factors, hydrographs, etc.)	32	10	14	6	..	..
Rainfall and run-off (factors, storage, etc.)	87	..	39	8	6	..
Stream flow, measurements, etc	39	9	26	38	7	10
Water wheels—types, details, and appurtenances	72	28	28	55	20	15
Hydraulics of the turbine	46	..	12	10	..	..
Selection and testing of turbines	65	4	..	12	..	9
Load curve, load factors, etc	20	..	..	..	..	..
Speed regulation, types of governors, etc	60	14	4	48	10	14
Arrangement of machinery and examples of plants	61	38	26	43	121	131
Relation of dam and power station	18	25	15	23	10	2
Design and construction of dams	24	79	65	204	26	20
Appendages to dams (gates, flashboards, etc.)	21	12	8	17	10	11
Canals, tunnels, flumes and pipe lines	6	10	18	37	6	38
Pondage and storage (effect, calculations, etc.)	22	10	4	34	..	..
Cost, value and sale of power	29	10	8	23	4	..
Investigation and analysis of water-power projects	10	13	23	..	4	4
Materials (wood, metal, cement, etc.)	..	69	..	..	..	..
Hydraulic construction (cofferdams, pumps, etc.)	..	38	13	..	..	24
Generators, transformers, switchboards, etc	..	41	25	..	29	76
Electric transmission and distribution	..	26	9	16	52	84
Hydraulic and pneumatic transmission	..	..	..	32	..	..
Appendices (water hammer, tests, etc.)	55	9	..	..	..	..
Tables	18	6	14	18	5	..
Total number of pages	757	500	372	640	310	442
Total number of illustrations	413	471	140	251	158	479
Net price	$6.00	$5.00	$6.00	$4.25	$3.00	$6.00
Date of copyright	1908	1907	1908	1903	1908	1909

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Design and Construction of Hydro-Electric Plants. By R. C. Beardsley. New York: McGraw Publishing Co. Reviewed, July 18, 1907.

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Development and Electrical Distribution of Water Power. By Lamar Lyndon. New York: John Wiley & Sons. Reviewed, July 16, 1908.

Hydro-Electric Developments and Engineering. By Frank Koester. New York: D. Van Nostrand Co.

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CORRESPONDENCE.

Tyrrell's "History of Bridge Engineering."

Sir: Replying to your comments in Engineering News, June 15, 1911, p. 84, on my recently published "History of Bridge Engineering":

The review says that "the book is a mere chronicle or descriptive list of a great number of bridges classified into chapters according to their general type and accompanied by outline elevations or half-tone views of the more important, and there is little of history in it." Nearly all books of history are necessarily a succession of descriptions and this one is no exception. The definition of the word *History*, according to Webster, is "a continuous narrative of events," while Chambers says it is "a statement of facts, an account of events, or the knowledge of facts and events." The corresponding definition of the word *chronicle* is "a register of events in order of time, a record." Measured by these definitions, the book appears to be a proper "history" of bridge engineering.

The review says that "an ideal history should show the gradual development of the art, the inter-relation of the various types and the effect of the various materials upon these types." With precisely these ideas in mind, the writer has endeavored as far as space would permit, to carry them out. In most of the chapters will be found an account of the prototypes for new forms of bridges showing the development or growth of these forms, as in the building of true arches from the false or corbeled arches of the Greeks; the change from semi-circular forms to elliptical and segmental curves through a need for wider waterway without elevating the road. The book explains the reason for many features on ancient bridges such as defense towers, shrines and chapels, and in modern times the substitution of shelters, pavilions and other useful features for the ancient ones no longer needed.

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Naturally no two writers treat the subject in the same way, and some of the differences are rather startling. Some of these differences are no doubt due to well-defined opinions as to what should appear in a book on this subject, while others are no doubt due largely to the author's personal experience. Whether the author has been mainly concerned with the hydraulic end or the electrical development, with the investigation and design or with the construction, seems to be reflected to some extent by his treatise.

The order in which I have tabulated them is not the result of any attempt to rank them, but is simply the order in which I went through them.

Mead devotes about 120 pages to rainfall and run-off, hydrographs, etc., while Lyndon and Koester hardly refer to them. Koester and Lyndon devote a very large space to the generation and transmission of electric current, while Mead does not consider them at all. Frizell also omits the subject of generators but discusses briefly the subject of transmission. It should be noted in this connection, however, that the titles of these two books do not refer to electrical equipment.

The hydraulics of the turbine is given by only three of the authors, the selection and testing of turbines by four, and load curves by only one.

The space devoted to speed regulation and governors varies from 60 pages to 4 pages, while the arrangement of machinery and examples of plant cover from 131 pages to 26 pages.

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REVIEWS.

The Heat Treatment of Tool Steel.

Reviewed by BRADLEY STOUGHTON.*

COMPOSITION AND HEAT TREATMENT OF STEEL.—By E. F. Lake, Steel Editor of the "American Machinist." New York and London: McGraw-Hill Book Co. Cloth; 6¼ × 9¼ ins.; pp. 252; 143 text illustrations. $2.50, net.

A practical and scientific book devoted to the heat treatment of tool steel, so clearly expressed as to be comprehended by an intelligent foreman of a forge or machine shop, and so well founded on the underlying scientific principles as to express the true basis of the art which is so little understood even by the best informed, does not exist in the English language. The author of this volume has not attained this ideal either, but he has presented a book that will be found very useful to the practical man from the standpoint of manipulation and scientific principles, as well as being illuminating to the scientific man not skilled in the actual practice of annealing, hardening, tempering and carbonizing of steel. Altogether this is a book which fills in part a real and crying need.

The author has devoted the first five chapters (covering altogether 63 pages) to the manufacture of iron and steel, and, as would be expected from the amount of space, the treatment is necessarily general and superficial, while, at the same time, giving an ignorant man some idea of the various processes, including blast furnace and electric smelting, the Bessemer, open hearth, puddling, crucible and electric refining processes.

Since the book naturally deals chiefly with steel intended for cutting tools, etc., it would seem that more space could profitably have been devoted to the crucible process, even at the expense of descriptive matter under the head of Castings for example.

Chapter V., on "Electrical Refining Furnaces," contains a good deal of valuable data which is comparatively new in text book form. Chapter VI., on the "Ingredients of and Materials Used in Steel," contains useful information on the effect of carbon, manganese, silicon, phosphorus, sulphur, oxygen, hydrogen, nitrogen, copper, nickel, chromium, tungsten, molybdenum, vanadium, titanium, aluminum, and some rarer elements entering into the composition of steels. Concerning the effect of carbon on steel, and especially the different solutions and compounds that are formed, the book repeats itself in various places without giving in any one place a clear-cut explanation of the subject. In general, however, the discussion of the effect of the different elements is good and is rendered more valuable by the language used, which is such as would be understood by the intelligent mechanic. There are several pages devoted to elements rarely used, the space given to which one misses sadly in the chapter on crucible steel.

Chapter VII. describes "Working Steel into Shape," including a very brief section on rolling, a somewhat longer discussion of steel castings and several pages devoted to forging by hand and power, drop forging and forging under the press. The hints here given, although somewhat brief, will be found very useful by those engaged in the forging of tool steel. The chapter closes with a brief section on welding.

Chapter VIII., on "Furnaces and Fuels Used for Heat-Treatment," gives about 30 pages of useful and interesting descriptive data with many illustrations, well selected, of the different types of furnaces employed.

Chapter IX. deals with "Annealing Steel," and after a very brief discussion of the theory, quotes the nine laws of Prof. Henry M. Howe governing this process. The author here mentions specifically the annealing of high speed steel, but we are surprised not to find in a book of this character a more thorough and comprehensive discussion of this most important type of tool steel, which would seem to be especially germane to the subject of such a volume. The brief notes on pages 101, 102, 208 and 209 hardly begin to treat the subject adequately.

Chapter X., on "Hardening Steel," gives a good deal of useful information on this subject. The hints to aid in this manipulation, and the descriptions of different types of apparatus employed, including furnaces, baths, etc., are good.

Chapter XI., on "Tempering Steel," is brief but concise and well selected, and the closing chapter on "Carbonizing" also contains a good deal of useful data for the benefit of those engaged in cementation, case hardening or other carbonizing processes.

The Index is far from adequate. A notable example of omission in the Index is "High Speed Steels," which is not listed under its own name.

Considered generally, the book is a useful one for those engaged in the treating of steel, or who have occasion to use it and care for it in machine shops, forges, etc., etc. It is far more important and valuable to this class of person than to those whose chief interest is in the theory and principles underlying the different operations. Nevertheless, the latter will find many useful and practical hints among its pages.

*Consulting Metallurgical Engineer, 165 Broadway, New York City.

A Plumbing Manual.

Reviewed by CHAS. B. BALL.*

PLUMBING AND HOUSEHOLD SANITATION.—By J. Pickering Putnam, Mem. Boston Soc. Archts. and of the Am. Inst. Archts. A course of lectures delivered before the Plumbing School of the North End Union, Boston. Garden City, N. Y.: Doubleday, Page & Co. Cloth; 5½ × 8 ins.; pp. 718; 708 figures in text. $3.75, net; by mail, 35 cts. extra.

A warmed-up book, like a warmed-up dinner, loses part of its flavor in the reheating process. This scholarly treatise would have attracted much greater attention if it had been published at the time when its subject matter formed the basis of a series of lectures before a plumbing school in Boston than now, after the lapse of eleven years.

The introduction, written in 1911, which summarizes various deductions reached in the text after protracted discussions, will by no means gain the general assent of adepts in sanitary design. For example, the author's advocacy of the unrestricted installation of unvented anti-siphon traps is a tenet which most sanitarians will condemn. On the other hand, his arguments for the omission of the main house trap are so conclusive as to commend the practice to an increasing number of adherents. The ten commandments in which he expresses the basic principles of plumbing design and operation merit the unanimous approval of his readers.

The arguments stated, and especially the illustrations used, appear greatly to over-emphasize the possible saving of cost by substituting "simplicity with security" for "complexity with insecurity," for which the author so strongly contends. No accepted authority would at the present time approve either of the extreme types used in the comparisons made, or admit that half the cost of the complicated system could be saved by the use of the "new simple system."

The chapters on bacteria, sewer air and microorganisms in sewer air quote results attained by many investigators and should put the reader in equipoise between "exaggerated fears on the one hand and a false sense of security on the other." "The impossibility or great improbability of specific diseases rising from sewers into our houses, protected as they are, or ought to be, by good drains and efficient traps, must, however, not lull our citizens and authorities into indolence and carelessness."

Pages 151 to 338 are devoted to traps and trap testing, treating the general topic under a number of divisions and with a profusion of illustrations. The classification of traps is complete and the statement of the characteristics possessed by a proper trap is important and satisfactory, except where tinged by the author's bias against trap vents. Much space is devoted to a description of the experiments through which the evolution of the author's well-known Sanitas trap came about.

The chapter devoted to wash basins well illustrates the rapid advances in the improvement of plumbing appliances during fifteen years past. Most of the types shown are now obsolete and therefore do not justify the space devoted to them. Recent types, of which a half dozen only are pictured, are characterized as "excellent" and leaving "little to be desired in essentials," but their advantages are not stated in detail. In this connection the fundamental arrangement, too often neglected even in present day design, for adequate sizes of waste outlets for all small fixtures "so that the fixture should act as a flush tank for its waste pipe and trap" is clearly set forth and cannot be too strongly endorsed as being of vital importance to the proper cleansing of traps and branches.

The twenty requirements which should be met by an ideal water closet are valuable, but the pages devoted to proving that pan, valve and plunger closets do not fulfill these provisions could be much better devoted to an amplification of the meager description of the common improved types, of which only two or three are illustrated.

The postulate that "since window area is very precious, especially in city houses, it should be reserved for the places where it is most needed and that is not in bath rooms," implies the position that houses do not need to have light in all rooms, with which no sanitarian of the present time is in harmony. The conclusion that "artificial light is entirely sufficient for bath rooms, and, properly placed, is more useful there than sunlight" should not pass unchallenged in view of the well known value of sunlight as a germicide and the increasing appreciation in the public mind that normal human existence is impossible without good natural lighting in habitations.

The occasional lapse of the author from his attitude of "philosophical inquiry" into the realms of imagination is shown by his injunction to "Observe the complication of the plumbing (Fig. 294) involved by the use of these wriggling, intertwining ventpipes, which, like venomous snakes, literally crawl about, ready to poison as well as puzzle and alarm the unhappy house owner or plumber who unskillfully handles them, with the noxious vapors which they are designed to carry off in their bodies. In the economy of nature the serpent is found to have some useful purposes, but the trap vent has none, and should suffer the serpent's curse and be crushed out of existence as soon as possible." Such a diatribe can by no means be respected an an "opinion * * * established by proper proofs," such as the precept of Liebig, which is quoted as a heading for Chapter I., requires.

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NITRIFICATION AND THE ABSORPTION THEORY.—An Account of the Principles of the Modern Sewage Filter. By F. Wallis Stoddart, F. I. C., F. C. S. Bristol, England: The Author. Paper; 6 × 9½ ins.; pp. 24; illustrated. For private circulation only.

Mr. Stoddart here describes some small-scale laboratory experiments in line with those described by him in 1893, namely, "a constant trickle of an ammoniacal solution over a column of air-charged medium, rendered active by seeding from a culture of the oxidizing organisms." His filter consisted of a 1-in. glass tube, filled to a depth of 3 ft. with marble broken as nearly as possible to the uniform size of ⅛-in.

The author takes direct issue with various advances during the last few years in England and Germany to the effect that sewage purification is effected chiefly by physical agencies and particularly by absorption. Repeated references are made to the writings of Dr. Dunbar, of Hamburg, in connection with the discussion of absorption and allied matters. Mr. Stoddart's specific conclusion as related to practical sewage treatment is that with a thoroughly clarified sewage, uniformly and continuously distributed, each cubic yard of material in a percolating filter

would be capable of dealing with quite 2,000 [Imp.] gals. produced by about 70 persons, in 24 hrs., if evenly delivered over that period; or from half to two-thirds of that quantity under the usual conditions of production.

It should be noted that this conclusion is based on British sewage and that the experiments themselves were not made with sewage.

Industrial Engineering.

Reviewed by AMASA TROWBRIDGE.*

PRINCIPLES OF INDUSTRIAL ENGINEERING.—By Charles Buxton Going, M. Sc., Managing Editor of the "Engineering Magazine;" Author of "Methods of the Santa Fé," etc. New York and London: McGraw-Hill Book Co. Cloth; 6¼ × 9½ ins.; pp. 174. $2, net.

Here we have a book which is the outgrowth of a series of lectures to college students.

It is of value principally to the man who is about to undertake the management of an industrial plant for the first time, or to the man who wishes to improve the conditions of the plant for which he is responsible, but who is himself not familiar with the various wage systems, premium plans and efficiency encouragers that have been invented. The book is good, because the author has brought his facts together in such form as to bring out their relative values, and has put the theories into clear outlines so that their good and bad features are easily perceived. Even a busy man will be repaid for the time required to read the book. The matter is treated in a very general way, and particulars are entered into in few instances. It is not a book designed to advertise someone's pet cost system and put out in the guise of a system of shop management. It is a general synopsis of the conditions met with in an industrial plant and a description of some of the plans for overcoming the difficulties encountered.

The author first outlines the relation of the elements of an industrial proposition. He lists the important elements as machinery, materials, methods, management, men and markets. He then states frankly that the gage for measuring and adjusting these elements is Money. The next general phase considered is the influence of conditions on industries and the influence of industrial organizations on men and methods.

In his third chapter, the author has given consideration to the evident problems of a manufacturing organization. He shows the necessity for an organization and describes in a general way the forms of organization usually found in the production department of a manufacturing industry. A brief outline of the salient features of two modern factory systems is given, together with an account of the way an ordinary factory is arranged to perform its functions.

The fourth chapter is about the forms of industrial ownership. He points out the advantages and responsibilities involved in each in few words. This chapter also includes a good deal of information about the routing of work through a factory.

Chapters five and six are devoted to defining expense and telling how it is distributed in determining the cost of production. This is such an involved problem, and so many solutions have been offered, none of which is capable of proof, that the author is forced to admit "that no absolute, mathematically correct and invariably true distribution of expense can be made." He does recommend the "machine-rate" system of distributing factory expense, but fails to give a good method for distributing general expense and depreciation.

The next two chapters, which are the best part of the book, treat of the methods of paying men, or "wage systems." The two primary systems of day wages and piece work are first described and are followed by the systems which the author classifies as "philosophies of labor management." These include the premium plans of Halsey and of Rowan, the Taylor differential piece rate, the Gantt bonus method and the Emerson efficiency system. The comparison of these wage systems is clear and fair. No one of them is slighted, although the bad features of each are pointed out. This is the most important subject treated for anyone endeavoring to improve conditions in an established industry, and the one requiring most careful study on the part of the beginner. It does not go into detail enough to enable one to adapt any of the various systems to a plant unless he already has a partial knowledge of the matter, but there is sufficient information given to enable one to select the form of wage system most likely to fit into a certain industry.

Profit sharing receives some attention, and the probabilities of its harmful influence are noted. This part of the work concludes with an extremely sensible suggestion in regard to the advisable extent of "welfare" or "betterment" work among employees.

The last chapter is about materials. One would naturally expect this to come first, but the author inverted the usual order of treatment on account of his desire to consider "expense" before taking up the question of paying for labor. He calls attention to the relation of materials, whether raw, stores, or finished, to the manufacturing problem in general. He also points out the important influence of this element, not alone because of its first cost, but also, by its size and form, having a great share in determining the methods to be pursued in working it into its finished state.

The greatest omission the author has made would seem to be money. He gives this item credit for having a large influence in every way on an industry. He then omits to explain the handling of money and its substitute—credit. For a beginner, at least, this is an extremely important subject, and it is one that vitally concerns every industrial engineer. A knowledge of it would save many an industry from being wrecked, and many more from being launched.

*C/o The Veeder Manufacturing Co., Hartford, Conn.

Carnegie Foundation Studies in Education.

THE CARNEGIE FOUNDATION FOR THE ADVANCEMENT OF TEACHING.—New York: The Carnegie Foundation (576 Fifth Ave.) Paper; 7¼ × 10 ins.
Report of the President and of the Treasurer. Pp. 113.
Bulletin No. 4: Medical Education in the United States and Canada. By Abraham Flexner, with an Introduction by Henry S. Pritchett, President of the Foundation. Pp. 346; two maps.
Bulletin No. 5: Academic and Industrial Efficiency. By Morris Llewellyn Cooke, M. Am. Soc. M. E. Pp. 134; eleven tables.

These three reports make a strong appeal to many who are broadly or deeply interested in educational matters. They are all the more interesting because they deal with a number of very live current topics which give rise to sharp differences of opinion among those who are more or less fully qualified to discuss them.

President Pritchett's report, besides dealing with the specific matters for which the Carnegie Foundation was created (retiring allowances for college professors and the provisions under which colleges and individuals are accepted as past beneficiaries) contains also a critical discussion of "The Relation of Colleges and Secondary Schools." This discussion takes up the complaints of the colleges and the schools against each other, each of which has been claiming with considerable bitterness of late that the other was seeking to dominate the situation. Interest is added to the discussion when it is read in connection with the bulletin on medical education, since it appears from the latter that a large percentage of medical students are still admitted to the medical schools of the country with less than high-school education, and since the colleges and many businessmen alike complain that even the four-year high-school training at best turns out a graduate who is wofully superficial in the fundamentals of education. One section of Dr. Pritchett's report deals, though very briefly, with "The Distinction between a System of General Education and a System of Industrial and Technical Education."

The bulletin on medical education is based on a careful investigation, through personal visits in 1908, of the 155 medical schools of the United States and Canada. The information thus secured was checked by data collected by the American Medical Association and by the Association of Medical Colleges. A vast majority of the medical schools of the country, in the opinion of Mr. Flexner, made a very poor showing indeed; how poor can better be understood when it is stated that 56 out of 155 schools had yearly incomes in 1908 below $10,000 per annum. Moreover, but a small percentage of the schools had anything like proper laboratory and hospital facilities, while, as already stated, a large percentage of the students had not received the benefits of high-school education before entering the medical school. Mr. Flexner presents a reconstruction plan based on what he conceives to be the real actual need for new doctors in different sections of the country. This scheme would cut down the number of schools from 155 to 31.

A section of Mr. Flexner's report of particular interest to our readers, in view of the recent agitation on the state licensing of engineers, is the one in which he deals with the examining boards in various states which grant licenses for medical practice. Only a few of these boards are so constituted, in the opinion of the author, as to secure anything like real tests of the fitness of candidates to practice medicine. The relations of the various medical "sects" to state examining boards present unfortunate and anomalous conditions which do not promise well for state licensing boards called upon to examine engineers of many grades in the different branches of the engineering profession.

Although the author lays little or no direct stress upon the subject, his report nevertheless shows very forcibly how sadly deficient is the training of nearly all our medical schools in public-health matters. It may be stated here that the author has a broad conception of the duties of the physician to society and on this account, as well as because of the need for it and for other reasons, he strongly advocates at least two years of general college education as a preliminary to the beginning of work in the medical school. We find in the report an interesting parallel between technical schools of engineering. This, with a significant introductory paragraph which places general college work in an interesting light, we quote as follows:

> Taking, then, modern medicine as an attempt to fight the battle against disease most advantageously to the patient, what shall we require of those who propose to enlist in the service? To get a somewhat surer perspective in dealing with a question around which huge clouds of dust have been beaten up, let us for a moment look elsewhere. A college education is not in these days a very severe or serious discipline. It is compounded in varying proportions of work and play; it scatters whatever effort it requires, so that at no point need the student stand the strain of prolonged intensive exertion. Further, the relation of college education to specific professional or vocational competency is still under dispute. It is clear, then, that a college education is less difficult, less trying, less responsible, than a professional education in medicine. It is therefore worth remarking that the lowest terms upon which a college education is now regularly accessible are an actual four-year high school training, scholastically determined, whether by examination of the candidate or by appraisement of the school.
>
> Technical schools of engineering and the mechanic arts afford perhaps an even more illuminating comparison. These institutions began, like the college, at a low level; but they did not long rest there. Their instruction was too heavily handicapped by ignorance and immaturity. To their graduates, tasks involving human life and welfare were committed: the building of bridges, the installation of power plants, the construction of sewage [sewerage] systems. The technical school was thus driven to seek students of greater maturity, of more thorough preliminary schooling, and strictly to confine its opportunities to them. Now it is noteworthy that, though in point of intensive strain the discipline of the modern engineer equals the discipline of the modern physician, in one important respect, at least, it is less complex and exacting. The engineer deals mainly with measurable factors. His factor of uncertainty is within fairly narrow limits. The reasoning of the medical student is much more complicated. He handles at one and the same time elements belonging to vastly different categories: physical, biological, psychological elements are involved in each other. Moreover, the recent graduate in engineering is not at once exposed to a decisive responsibility; to that he rises slowly through a lengthy series of subordinate positions that search out and complete his education. Between the young graduate in medicine and his ultimate responsibility—human life—nothing interposes. He cannot nowadays begin with easy tasks under the surveillance of a superior; the issues of life and death are all in the day's work for him from the very first. The training of the doctor is therefore more complex and more directly momentous than that of the technician. Be it noted, then, that the minimum basis upon which a good school of engineering to-day accepts students is, once more, an actual high school education, and that the movement towards elon-

gating the technical course to five years confesses the urgent need of something more.

Before leaving Mr. Flexner's report it should be stated that it is prefaced by a brief but well-put introduction by Dr. Pritchett, who, as many of our readers know, was for some years President of the Massachusetts Institute of Technology and before that was Superintendent of the U. S. Coast and Geodetic Survey.

Mr. Cooke's report on "Academic and Industrial Efficiency" has given rise to both merriment and scorn on the part of many, according to the temperament of the critics. We think, however, that every fair-minded person who gives the report careful consideration will believe that the study was well worth while, however much or little he may agree with the opinions and conclusions of the author. This report also has a brief prefatory statement by Dr. Pritchett, who makes no attempt to criticize or discuss the report further than is involved in explaining the object of the investigation and the spirit in which the report should be considered.

Mr. Cooke's study was designed to be conducted "through the eyes of a business man, and of one generally familiar with modern practice in ['industrial'] management." In his comments on the report, after reference to the necessity of organization in the conduct of any enterprise, whether business, social or educational, Dr. Pritchett says:

I apprehend that these fundamental principles of organization and of administration are accepted by all. Furthermore, it will be generally admitted that in a few decades our colleges and universities have expanded enormously, and that they have undertaken, under new and hitherto unknown conditions, operations of far greater complexity than they dealt with during the previous quarter century. It may therefore well happen that the mechanical side of their organizations has not kept up with the demands and the complexities of their problems, and that they may gain from the intelligent study of college forms of organization a real help from those who conduct industrial enterprises, without at the same time in any measure losing sight of the fact that scholarly and spiritual leadership is the highest quality of college efficiency and the one most necessary to attain. It may be well also to remember that sincere and helpful leadership in intellectual and spiritual matters will in no wise be injured by a frank and open examination of the material factors which enter into college problems.

There is a still more practical side which has as yet received but scant attention, but which must in the next decade be met squarely by those who direct educational institutions. The cost of university education has risen throughout the world, but nowhere so rapidly as in the United States. Single universities in America are now spending larger incomes than any educational institution has ever spent in the world's history. Not only is this true, but the whole demand of the American university to-day is for more money. No doubt, this demand is urgent; nevertheless it is clear that this process cannot be indefinitely extended unless we greatly restrict the number of universities. It may well be that a thorough-going administrative study of the income and expenditure of one of our large and newly grown universities may be more helpful to it at this moment than more money. We have gone through a period of great expansion. Just now a critical examination and appreciation of what we are getting out of the expansion is probably more to be desired than farther expansion.

In any event, only good can come to an organization—whether it be commercial, educational, or religious—when a friendly hand turns the light of public scrutiny upon its methods, resources and aims. This study is therefore commended, without discussion as to its merits, to the thoughtful examination of college officers, trustees and teachers, as a friendly attempt to contribute to the solution of college problems from the standpoint of one who has to do with industrial efficiency, and without any preconceived opinion as to how far the analogy which its title suggests may be pushed. The college is partly a business, and partly something very different from a business. Mr. Cooke is concerned only with the former aspect. It will be interesting for those to whom the latter viewpoint is more natural to consider how far his observations have suggestive significance.

Mr. Cooke was directed "to obtain an estimate of the cost and of the output both in teaching and in research in the departments of physics in" Columbia and Harvard universities, Massachusetts Institute of Technology, Toronto, Wisconsin and Princeton universities and in Haverford and Williams colleges. His report consists of text and a mass of analytical tables. The text is divided between such topics as general organization, efficiency gages (which the author states are lacking), the college professor as a producer, research work, the economical use of buildings, functional activities, financial administration and the administration of the department of physics. As the best available measure of efficiency in its various phases Mr. Cooke chooses student hours.

We shall not attempt here any summary of Mr. Cooke's report, nor even of his conclusions, further than to say of the latter that the author expresses himself as strongly convinced that great reforms in both educational and financial efficiency might be made by applying to college work some of the principles in use in the best business organizations of the country. It is only fair to add that while some of his critics have written as though Mr. Cooke's point of view was wholly materialistic, and thus utterly inapplicable to educational efficiency, Mr. Cooke himself makes it plain that he realizes that there are limitations to his method of study, even if it does not always make due allowances for them. We may say further, although disclaiming any attempt to apologize for Mr. Cooke, that, even though some of his critics be right in alleging that in making this report he was quite out of his proper field yet, as Dr. Pritchett suggests in the quotation which we have made, no harm but much good may come from having even the sacred quiet of the college looked into by one who is accustomed to the din and rush of factories and of engineering works.

Were this not so busy a world, we should urge on many of our readers the desirability of obtaining and reading all three of the volumes which we have noted. As it is, we shall feel that we have fulfilled our duty by calling attention to some of the points of general and of special interest in each of them, in order that one or the other or all may be obtained and consulted according to the time and inclination of our readers.

A special report on law schools, similar to the one on medical schools, may be expected soon, we understand, and there is reason to believe that other professional schools will also be investigated. We shall await with interest a report on engineering schools.

Finally, we venture to protest mildly against the awkward size (7¼ × 10 ins.) of these reports and to make a stronger protest against the width of the printed page (5 ins.) which makes somewhat difficult eye-work of reading the report, notwithstanding the clear, handsome type, good printing and excellent paper.

Forests and Runoff.

THE FLOW OF STREAMS AND THE FACTORS THAT MODIFY IT, WITH SPECIAL REFERENCE TO WISCONSIN CONDITIONS.—By Daniel Webster Mead, C. E., Professor of Hydraulic and Sanitary Engineering. Madison, Wis.: The University of Wisconsin, Bulletin No. 425. Paper; 6 × 9 ins.; pp. 192; 99 text illustrations and 17 tables. 40 cts., net.

The discussion regarding the effect of forests on run-off of rivers, which raged so fiercely about two years ago, is just beginning to show up in permanent literature. Many of the opinions that were then so freely aired, were mere opinions based on past authority and incomplete data and were not the result of personal study of their author or of any ordered investigation into physical phenomena. It was but natural, then, that the earnest searchers after the truth of the controversy should immediately start the personal study and ordered investigation which had been generally lacking, and it is not strange that considerable time should have been required in the process. This partly explains the seeming quiet that has of late prevailed among the disputants and the recent appearance of some elaborate monographs on the general subject of stream flow, with its more controversial adjunct, the effect of deforestation on floods. Among these volumes none is more important than the one by Prof. Mead, noted above.

As indicated by the title, this study is a general one, with the actual conditions in Wisconsin as the example which illustrate the [illegible]ductions. Prof. Mead first takes up the proble[illegible] of runoff and discusses separately the various [illegible]tors that control or modify runoff. These [illegible]tors are precipitation, disposal of rainfall, [illegible]perature, topography, geology, surface conditi[illegible], natural storage, character of the bed of [illegible] streams, and artificial control of streams. [illegible]der each of these topics, the general inferen[illegible]s backed up by field data on the Wisconsin [illegible]ams running back through a number of year[illegible].

In general, Prof. Mead comes to t[illegible] following conclusions:

The quantities and variations of stream flow are due to a large number of concomitant factors, some fixed and some variable, each having an influence in proportion to its own character and intensity and the relative character and intensity of every other factor. The combinations of these factors are so numerous, and differ so widely even on a single drainage area, that no problem of flow can be determined even approximately from a consideration of the factors themselves except by means of a comparison with the actual relative effects under circumstances more or less similar to those under investigation.

The mean annual stream flow on any stream, and the variation in the stream flow throughout the year, depend mainly on the quantity and distribution of the precipitation, modified by temperature conditions.

Extreme floods are due to the simultaneous occurrence of temperature and precipitation conditions, favorable to excessive runoff, and no practicable works of man, such as drainage works, reservoirs, or reforestation, can materially affect the flood peaks on the larger Wisconsin rivers.

In general, the deforestation or cutting of timber in Wisconsin has had no material effect, either favorable or adverse, on the high water, mean water, or low water flow of the streams, or on the regularity of such flow.

On the Wisconsin River the changes in the original conditions due to drainage, deforestation, etc., have not affected the mean and low water flow but may have slightly improved the regularity of the ratio of precipitation to runoff, and may have slightly increased the ratio of high water peak to mean water; but such effects have been insignificant and of no material advantage or disadvantage to the flow of the stream, and the flow of the Wolf River and of the Upper Mississippi River shows no such changes in flood peaks or betterment in regularity.

From these short abstracts from his general conclusions, it will be seen that Prof. Mead is against the forest as a flood restrainer, and against reservoirs as flood-protective devices. His main argument is, however, that the complication of factors controlling the flow of streams is such that the short space of time through which we can have data is not sufficient to allow a fixed law to be observed.

REPORT OF THE BOARD ON MINING DEBRIS OF THE COLONY OF VICTORIA, AUSTRALIA, FOR THE YEAR 1910.—E. H. Goodenough, Secy. Melbourne, Australia: Pub. Doc. Paper; 8¼ × 13 ins.; pp. 25; 19 plates.

It is an interesting example of the variation in nomenclature in different countries that this pamphlet is entitled "Report of the Sludge Abatement Board." An American or English civil engineer picking up such a pamphlet would naturally conclude from the title that it related to matters in connection with sewage disposal. In Australia, however, the term "sludge" is used to signify the sand and mud resulting from mining operations. The work of the Board is in fact much similar to what has been done, or rather attempted, by the California Mine Debris Commission.

As most of our readers know, the attempt to apply engineering methods to the mine debris problem in the Far West, so as to permit the working of rich deposits of ore without the destruction of a large area of valuable lands and the choking of rivers, has been very far from successful.

Apparently, they do these things better in Australia. The Sludge Abatement Board reports that during 1910 less damage was caused by sludge than in any previous year since mining was carried on on a large scale. The board declares that mining men all over the State are realizing that by proper methods much may be done, without great expense, to reduce the damage from mining operations and mining debris.

It is interesting to note also that the Govern-

ment of Victoria decided about five years ago to issue no leases permitting mine dredging unless the lessees would agree to cover the gravel left by their workings with a substantial thickness of good soil. This appears to be in accordance with good public policy. To reduce large areas of land to the condition of a desert and make it forever unavailable for agriculture is an injury which is not compensated for by the feverish activity of a few years of gold mining.

TUBERCULOSIS HOSPITAL AND SANATORIUM CONSTRUCTION.—Written for the National Association for the Study and Prevention of Tuberculosis. By Thomas Spees Carrington, M. D., Assistant Secretary. New York: The Association (105 E. 22nd St.) Stiff paper; 7 × 10½ ins.; pp. 164; 110 illustrations in text. 25 cts., postpaid.

Some two years ago the National Association for the Study and Prevention of Tuberculosis published a pamphlet entitled "Some Plans and Suggestions for Housing Consumptives," which has had a wide circulation. The present book, noted above, is an enlargement of this pamphlet, much extended and broadened. Throughout the country the movement toward the control and prevention of the "white plague" has marvelously developed in the past few years, and one of its most evident results is the number of official hospitals and sanitaria which are being erected by states and municipalities. It is concerning the construction of these hospitals that the present book is designed. A great number of institutions are shown, both in drawing and description, and the requirements of an ideal group of buildings under the varying conditions which must exist, are explained at some length. Cost data plays no little part in these requirements. It should prove a most useful handbook for any official or commission having the design of such an institution in prospect.

NATIONAL PROBLEMS AFFECTING THE LUMBER INDUSTRY.—Workmen's Compensation, Applied Principles of Efficiency, The Panama Canal, Popular Ignorance, Currency Reform [and] Practical Forestry. Official report, National Lumber Manufacturers' Association Convention, held in Chicago, Ill., May 24-25, 1911. (George K. Smith, Secy., St. Louis, Mo.) Cloth; 6 × 9¼ ins.; pp. 278.

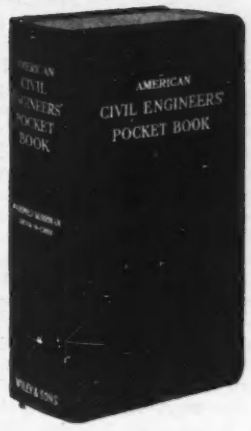
This is the report of the Ninth Annual Convention of the National Lumber Manufacturers' Association, and contains all of the papers and discussions there presented. It has been published under the above-noted popular title, so as to bring to the attention of the general public the present state of the lumber industry. Unfortunately, the publicity gained is not apt to be especially desirable, for the papers consist mainly of very querulous protests against the government's policy of conservation and protesting denials of the existence of a lumber trust. Added to this are several papers exploiting all of the sensational, press-agent yarns about the dangerous qualities of the building materials competing with lumber. Something is wrong when such methods need be advocated to sell wood products.

THE AMERICAN CEMENT DIRECTORY.—Edition of 1911. Compiled and published by the Technical Press, Ford Bldg., Detroit, Mich.; W. A. Gibson, Manager. Flexible morocco; 3 × 5 ins.; pp. 104. $1, net.

In addition to the regular directory of Portland Cement Plants with their list of officers and capacity, indexed under the name of the company, this annual contains some tabular descriptions of the various kinds of crushing machinery, and a buyer's index of the cement industry. It does not contain the usual index, by name, of the officers and main employees of these plants.

TREES, FORESTRY AND LUMBERING.—A List of Books and of References to Periodicals in the Brooklyn Public Library, Brooklyn, N. Y. Paper; 4¼ × 6¼ ins.; pp. 40. Gratis.

One of the most useful functions of the public library is the preparation of bibliographical lists covering special topics or some limited field of knowledge. Of such a nature is the little pamphlet noted above. Although it covers only those books and articles contained in the Brooklyn Public Library, the size of that library makes the list of sufficient scope to serve all working needs. A copy of the booklet will be sent to any one asking for it.



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The Effect of Mechanical Power on Civilization.

POWER.—Columbia University Lectures. By Charles E. Lucke, Ph. D., Professor of Mechanical Engineering, Columbia University. New York: The Columbia University Press. Agents: Lemcke & Buechner (30 W. 27th St., N. Y.) London: Henry Frowde (Amen Corner, E. C.) Cloth; 5¼ x 8 ins.; pp. 316; 223 figures in text. $2, net.

These lectures by Prof. Lucke are popular rather than technical in character, but a surprising amount of engineering work is described. However, the presentation of mechanical details is so gradually led up to that it should not be difficult for any interested reader to grasp the distinctions which set off one piece of power apparatus from another: a steam turbine from a water wheel and a gas engine, or a Scotch boiler from a water-tube type. The lectures are intended to show the tremendous influence, on the whole social fabric of the world, which the spread of power-actuated machinery has wrought and to that end the author has traced the development of the three great types of prime power—steam, water and gas. At opportune times, the immediate industrial change effected by each development and each great new application of power are portrayed.

The whole series of lectures forms a thoughtful review of progress and one which can profitably be read by engineers everywhere; for, though it will convey little or nothing new to them about their own profession, it may serve to orient in their thoughts the true position of the profession and to remind them of the basis which it has for claiming a larger share of the world's regard.

City Planning.

PITTSBURG: MAIN THOROUGHFARES AND THE DOWN TOWN DISTRICT.—Improvements Necessary to Meet the City's Present and Future Needs. Report by Frederick Law Olmsted. Prepared under the direction of the Committee on City Planning. Pittsburg, Pa.: Pittsburg Civic Commission. Cloth; 6¾ x 10¼ ins.; pp. 169; illustrated.

MADISON: A MODEL CITY.—By John Nolen, Fellow of the American Society of Landscape Architects. Madison, Wis.: City Doc. Paper; 7¼ x 10¾ ins.; pp. 168; 120 illustrations.

GENERAL FEATURES OF A PARK SYSTEM FOR CHATTANOOGA, TENNESSEE.—Report to the Board of Park Commissioners. By John Nolen, Landscape Architect, Cambridge, Mass. Chattanooga, Tenn.: City Doc. Stiff paper; 6 x 9¼ ins.; pp. 27; one folding map and six plates.

PHILADELPHIA.—Comprehensive Plans Number, Vol. IV., No. 3, March, 1911. Philadelphia, Pa.: City Doc. Paper; 9 x 12 ins.; pp. 59; illustrated.

The publications named above afford good illustrations of the interest in city planning which now extends over the whole country.

Mr. Olmsted's report on Pittsburg is one of an extensive series of studies being made for the Committee on City Planning of the Pittsburg Civic Commission. One of the objects of the Commission in having these studies made is "to contribute to the economy, convenience, practicability and attractiveness of Pittsburg's development and growth." At the inception of the work Messrs. Bion J. Arnold, John R. Freeman and Frederick Law Olmsted were retained.

In the present report, Mr. Olmsted discusses the general problems indicated by the title to the report and recommends the cutting down of the "Hump" and the widening of certain streets in the "Hump" District, together with the extension and widening of a number of streets and avenues in various parts of the city, the elimination of a number of grade crossings and bridge and tunnel improvements.

The report is accompanied by a number of illustrations, including plans and half-tone views. Many of the illustrations show city improvements already accomplished in various parts of the world, and some of them relate specifically to Pittsburg needs.

Mr. Nolen's Madison studies center around the idea of making the City of Madison physically worthy of the State Capitol and State University located there, and at the same time of making the most of the natural beauties of the site of the city incident to the beautiful lakes in and adjacent to it. Notable among the 17 recommendations made by Mr. Nolen are the following: The securing of legislation to protect "the environs of the State Capitol;" the acquisition of "property between Capitol Square and Lake Monona" and the adoption of a plan for its development; the widening and improvement of "State St., from the Capitol to the University;" the establishment and improvement of the various "main thoroughfares in and near Madison;" the securing of "the most important lake frontages with a view to the formation of the Four Lake District;" parks, parkways and playgrounds, and studies of both the improvement of the housing of people of limited means and of the finances of the city as related to the various improvements suggested.

It is only fair to the Madison Park and Pleasure Drive Association to say that much has already been attained by that organization toward the improvement of Madison and vicinity along some of the lines recommended by Mr. Nolen. This is properly recognized in the report.

Included in Mr. Nolen's report are numerous handsome half-tone engravings showing both what has already been accomplished in the way of city and district improvement at Madison and also some of the improvements remaining to be effected. The report also includes various engravings which show city improvements in other parts of the world and a number of diagrams and maps, both local and otherwise.

The Chattanooga report, also by Mr. Nolen, is a study of the park needs of Chattanooga. Among the recommendations made are some which look to supplementing the famous national parks in the vicinity.

The official municipal publication, "Philadelphia," for the month of March, contains a review of city planning studies recently undertaken at Philadelphia by various committees and is accompanied by many half-tone engravings showing what is already under way or proposed.

MATHEMATICS FOR THE PRACTICAL MAN.—Explaining Simply and Quickly All the Elements of Algebra, Geometry, Trigonometry, Logarithms, Coordinate Geometry, Calculus. By George Howe, M. E. New York: D. Van Nostrand Co. Cloth; 5 x 7½ ins.; pp. 143; 42 text figures. $1.25, net.

Mr. Howe has produced something new: a book which explains the elementary operations of algebra, trigonometry and calculus in such simple manner as to enable almost anyone to acquire a fair understanding of them very rapidly. More than this, the reader if he applies himself somewhat can actually use the subject-matter of the book in calculations. Since the text is well written, with apt choice of comparisons and illustrations to explain a principle, and all statements are correct and precise, the book can be recommended most heartily. It appeals particularly to those who, having stopped their mathematical education with arithmetic, later come to feel the need for getting some knowledge of the more complex methods of calculation, and who have sufficiently matured sense to be able to make the step from number computation to symbol computation without slow adaptation to the changed form of thought.

Most of the book is devoted to algebra, of course. There are eight chapters on this subject, going as far as the solution of quadratic equations. Then there is a chapter giving some of the theorems of plane geometry, and one on the symbols of trigonometry, the latter going little beyond an explanation of the meaning of the circle functions. Logarithms are next explained, and a table of logarithms is appended to the book; whether the reader will be able to get a satisfactory working familiarity with logarithms will depend on whether he has sufficient interest to acquire practice on a good number of examples. The last two chapters deal with coordinate geometry and calculus, and naturally hang together.

The book could have been made somewhat larger without hurt to its purpose; this would have made it possible to go a little farther, in trigonometry for example. So also its value for self-study is slightly reduced by the fact that not all the examples are chosen from practical fields, and by the occurrence of several typographical errors which may puzzle the student. But the criticisms are of detail, and do not alter the fact that an excellent aid to the ambitious learner is made available by his book.

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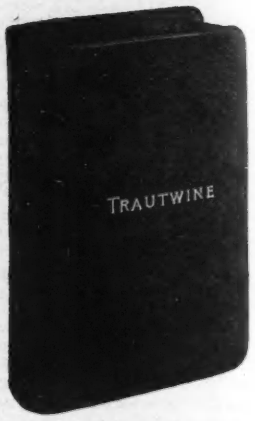

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APPLIED ELECTROCHEMISTRY.—By M. DeKay Thompson, Ph. D., Assistant Professor of Electrochemistry in the Massachusetts Institute of Technology. New York: The Macmillan Co. Cloth; 6 × 9 ins.; pp. 329; 137 illustrations in text. $2.10, net.

THE CARE OF AUTOMOBILES.—With a List of Don'ts for Motor Car Drivers and Acute Automobilia. Compiled and written by Robert E. Sherwood. New York: The Neis Publishing Co. Cloth; 5 × 6¾ ins.; pp. 73.

CENTRIFUGAL PUMPS.—Their Design and Construction. By Louis C. Loewenstein, E. E., Ph. D., and Clarence P. Crissey, M. E. New York: D. Van Nostrand Co. Cloth; 6¼ × 9½ ins.; pp. 435; 320 text illustrations and 8 folding plates. $4.50, net.

DEPARTMENT OF HEALTH OF THE CITY OF CHICAGO.—Report for the years 1907-10. W. A. Evans, M. S., M. D., L. L. D., Commissioner. Chicago, Ill.: Pub. Doc. Stiff paper; 5½ × 8½ ins.; pp. 446; map and illustrations.

ELECTRIC LIGHT FOR THE FARM.—Part I.: Low Voltage Electric Lighting with the Storage Battery. Part II.: Wiring Houses for the Electric Light. By Norman H. Schneider. New York: Spon & Chamberlain. London: E. & F. N. Spon, Ltd. Cloth; 5 × 7¼ ins.; pp. 86; 42 text figures. $1, net.

ENSAYO SOBRE ABASTO DE AGUAS PARA BOGOTA.—Tesis Presentada por Cristobal Bernal, para obtener el titulo de Ingeniero Civil. Bogota, Colombia: Imprenta Electrica, 168, Calle 10. Paper; 6½ × 9½ ins.; pp. 36.

DIE GRUNDLEHREN DER HOEHEREN MATHEMATIK.—Zum Gebrauch bie Anwendungen und Wiederholungen Zusammengestellt. By Dr. Georg Helm, Geheimer Hofrat, Professor an der K. Techn. Hochschule Dresden. Leipzig: Akademische Verlagsgesellschaft m. b. H. Paper; 6 × 9½ ins.; pp. 419; 387 text figures.

AN INTRODUCTION TO THE THEORY OF STATISTICS.—By G. Udny Yule, Hon. Secy. Royal Statistical Society of London; Mem. International Statistical Institute; Fellow of the Royal Anthropological Institute. London: Charles Griffin & Co., Ltd. Philadelphia, Pa.: J. B. Lippincott Co. Cloth; 5¼ × 7¾ ins.; pp. 376; 53 text illustrations. $3.50, net.

THE MAXVILLE LIMESTONE.—By William Clifford Morse. Fourth Series, Bulletin No. 13, Geological Survey of Ohio; J. A. Bownocker, State Geologist. Columbus, Ohio: Pub. Doc. Cloth; 6½ × 9¾ ins.; pp. 128; five plates and six text figures.

MEMORIA QUE PRESENTA EL MINISTRO DE OBRAS PUBLICAS.—A las Camaras Legislativas en su Reunion Constitucional de 1911, Estados Unidos de Venezuela. Caracas, Venezuela: Pub. Doc. Paper; 9¼ × 12½ ins.; pp. 295; many plates and inset sheets.

METROPOLITAN WATER AND SEWERAGE BOARD (Boston).—Report for 1910. Boston, Mass.: Pub. Doc. No. 57. Cloth; 5¾ × 9 ins.; pp. 245; seven illustrations and 47 tables.

PRACTICAL APPLIED ELECTRICITY.—A Book in Plain English for the Practical Man. Theory, Practical Applications and Examples. By David Penn Moreton, B. S., E. E.; Associate Professor of Electrical Engineering at Armour Institute of Technology, Assoc. M. Am. Inst. E. E., etc. Chicago, Ill.: The Reilly & Britton Co. Flexible leather; 4½ × 7¼ ins.; pp. 438; 323 text illustrations; 15 tables. $2, net; postage 12 cts. extra.

THE PRINCIPLES OF AEROPLANE CONSTRUCTION.—With Calculations [and] Formulae. By Rankin Kennedy, C. E. New York: D. Van Nostrand Co. Cloth; 5¼ × 8½ ins.; pp. 137; 50 diagrams in text. $1.50, net.

THE PRODUCTION OF MALLEABLE CASTINGS.—A Practical Treatise on the Processes Involved in the Manufacture of Malleable Cast Iron. By Richard Moldenke. Cleveland, Ohio: The Penton Publishing Co. Cloth; 6 × 9¼ ins.; pp. 113; 35 plates. $3, net.

PUMPING MACHINERY.—A Treatise on the History, Design, Construction and Operation of Various Forms of Pumps. By Arthur M. Greene, Jr., Professor of Mechanical Engineering, Russell Sage Foundation, Rensselaer Polytechnic Institute. New York: John Wiley & Sons. London: Chapman & Hall, Ltd. Cloth; 6 × 9 ins.; pp. 703; 504 text illustrations. $4, net (17/—net).

RADIUMNORMALMASSE UND DEREN VERWENDUNG BEI RADIOAKTIVEN MESSUNGEN.—By E. Rutherford. Deutsch von Dr. B. Finkelstein. Leipzig: Akademische Verlagsgesellschaft m. b. H. Paper; 6 × 8½ ins.; pp. 45; three text figures.

RAND WATER BOARD.—Report to the Administrator of the Province of Transvaal, March 31, 1911. Johannesburg, So. Africa: The Board (M. McCormack, Secy., Corner House). Paper; 8¼ × 13 ins.; pp. 62; two diagrams.

RESISTANCE TO FLOW THROUGH LOCOMOTIVE WATER COLUMNS.—By Arthur N. Talbot and Melvin L. Enger. Bulletin No. 48, University of Illinois, Engineering Experiment Station. Urbana, Ill.: The University. Paper; 6 × 9 ins.; pp. 72; 42 illustrations and six tables in text. Gratis.

THEMEN DER PHYSIKALISCHEN CHEMIE.—Auf Veranlaseung des Vereins deutscher Ingenieure an der Technischen Hochschule, zu Braunschweig gehaltene Vorträge. By Dr. Emil Baur, Professor an der Techn. Hochschule in Braunschweig. Leipzig, Akademische Verlagsgesellschaft m. b. H. Paper; 6½ × 9½ ins.; pp. 113; 32 text figures.

U. S. DEPARTMENT OF AGRICULTURE.—Logan Waller Page, Director. Circular No. 94: Progress Reports of Experiments in Dust Prevention and Road Preservation, 1910. Prepared by the Office of Public Roads. Washington, D. C.: Pub. Doc. Paper; 6 × 9 ins.; pp. 56.

VANISHED ARIZONA.—Recollections of the Army Life of a New England Woman. By Martha Summerhayes. Salem, Mass.: The Salem Press Co. Second edition. Cloth; 5 × 8 ins.; pp. 319; 26 illustrations. $1.60, postpaid.

WATER-SUPPLY PAPER, U. S. GEOLOGICAL SURVEY.—Geo. Otis Smith, Director. No. 274: Some Stream Waters of the Western United States, With Chapters on Sediment Carried by the Rio Grande and the Industrial Application of Water Analyses. By Herman Stabler. Washington, D. C.: Pub. Doc. Paper; 5¾ × 9 ins.; pp. 188.

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